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LVS 9000 Overview

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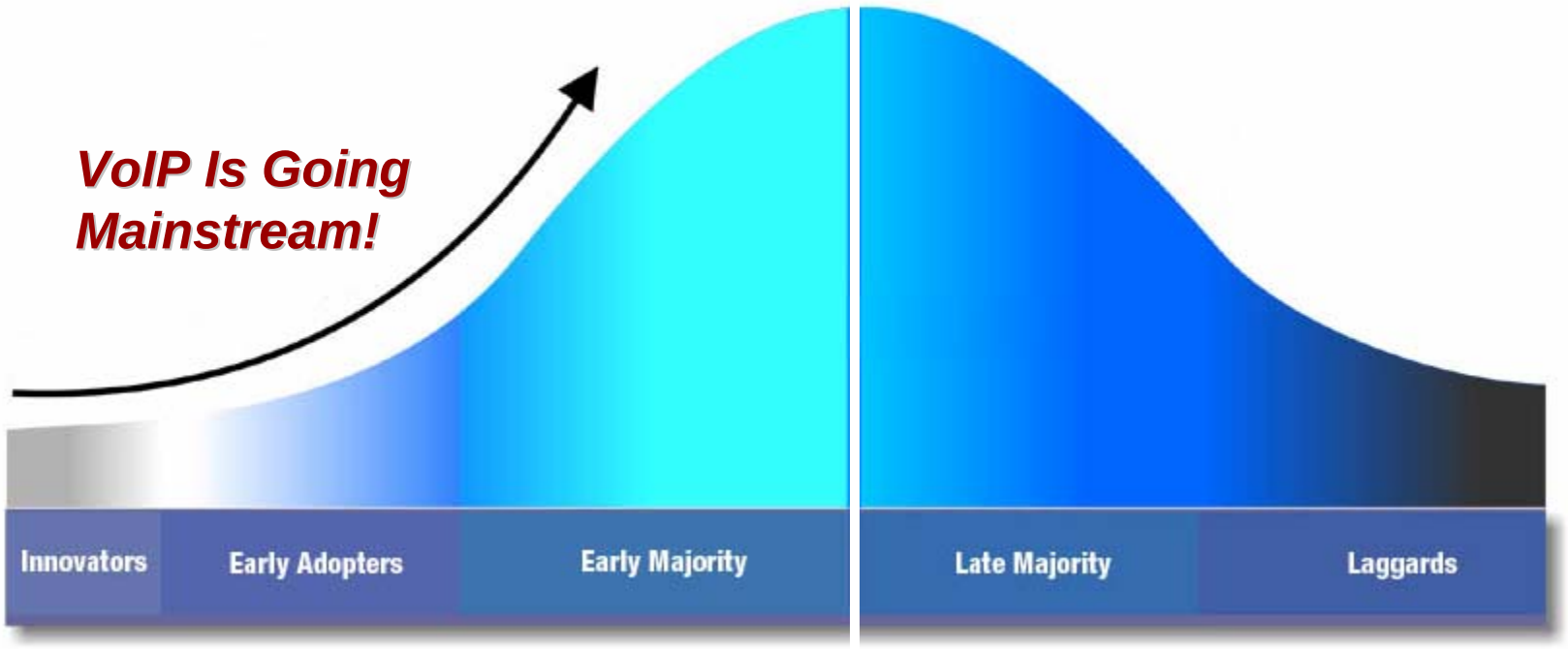
Voice over IP is Everywhere

Lower Monthly Bills for Broadband Access and the Usage of Broadband Phone Services Coupled with Availability of Advanced Telephony Features Are Driving Small Businesses to Use VoIP Services



The popularity of consumer VoIP services and large enterprise adoption of IP telephony are a testament that the technology works and is going mainstream

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Broadband Phone Services for Small Business

- **Non-Geographic "Virtual" Numbers**
  - Make a Small Business Look "Big"
  - Allow "Local" Access to Customers
- **Web Based Customer Portal**
  - Additional Lines Added with Ease
  - Call Detail Records and Accounting
- **Voicemail**
  - "One Button" Access to VM Box from IP Phone
  - Voice Mail Notification
  - Check VM from Regular Phone
  - Check VM from E-mail
    - Simple Alert
    - Voice Message Attached as a WAV or MP3 File
- **"Meet Me" Conference Calling**
- **Call Forwarding and "Find Me"**

Powerful Features at Affordable Prices !!

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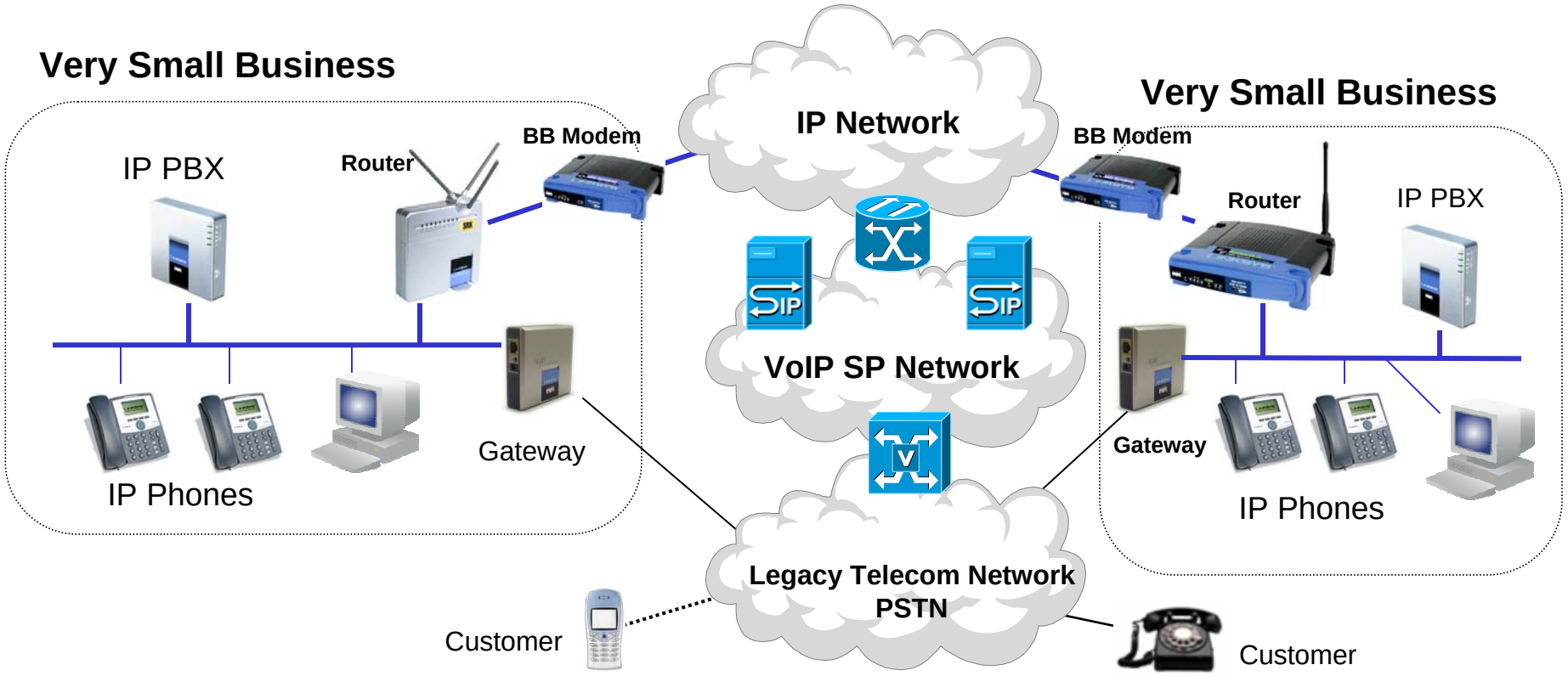
Small Business VoIP Over Broadband Network



- The IP PBX System Provides SIP Server (Registrar and Proxy) Functions
- VoIP Service Provider Supports:
  - Voice and Services – Phone Numbers, Call Origination & Termination, Off-Net Call Routing
  - Voice Messaging Services – Voicemail, Unified Messaging, etc.
- Voice and Data Traffic Between Sites is Carried by the IP Network.
- PSTN Carries Overflow Voice Traffic if the VoIP Service is Unreachable via LAN Attached Gateway Appliance (PSTN = Public Switched Telephone Network)

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Introducing the LVS 9000

Linksys Voice System 9000

IP Telephony System

For Home Offices and Small Business

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LVS 9000 Requires VoIP Service Integration

- The LVS 9000 Must be Integrated with a Linksys Certified LVS 9000 VoIP Service Provider's Service
- The VoIP Service Provider Provides the Following Services:
  - Outbound Call Termination Services
    - Local, Long Distance, and International Calling
  - Inbound Call Origination Services
    - DID – Direct Inward Dialing
    - Toll Free Services
  - Voicemail Boxes
  - Provisioning Server and Firmware Upgrades
  - Tier II Technical Support

- A List of Participating VoIP Service Providers Are Available on: **www.linksys.com**

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LVS 9000 Installation and Support Cont.

- **SP Model**
  - SP Purchases Equipment From Linksys Distributor
  - SP or Their Agent Sell Equipment to End User Customers
  - SP Ships Equipment to End User Customers
  - SP, Installer, Agent or Customer Responsible for Setting Up Equipment with SP Account Information
  - SP or Agent Responsible for providing Support to End User Customers
  - Options / Additional Steps
    - Remote Provisioning Configuration
    - Customer Provided With Access to Portal for Account Management

- **VAR Model**
  - VAR Purchases Equipment from Linksys Distributor
  - VAR Sells Equipment to End User Customers
  - VAR Configures and Installs Equipment with SP Account Information
  - VAR Provides Support to End User Customers
  - Options
    - Remote Provisioning Configuration
    - Customer Provided With Access to Portal for Account Management

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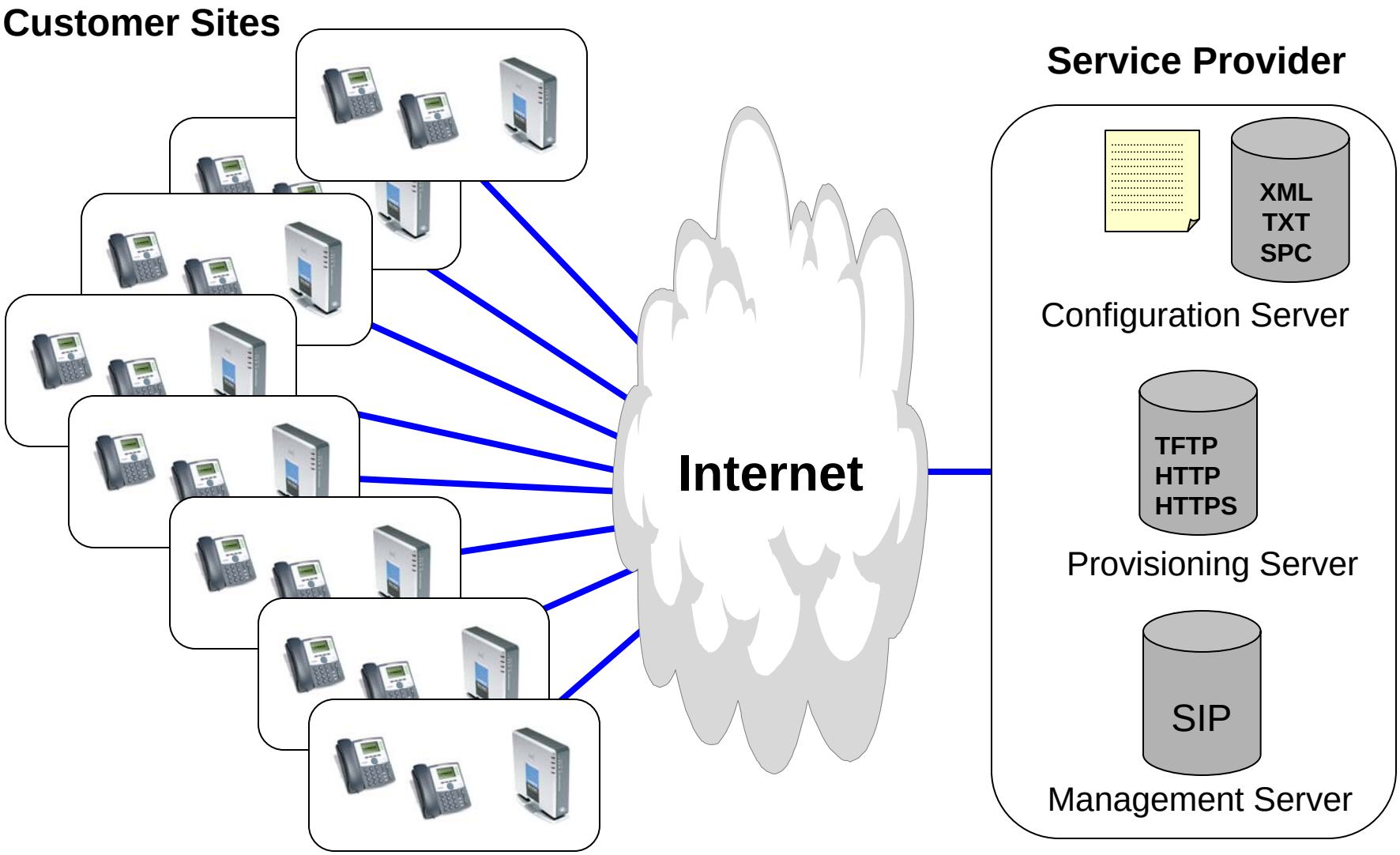
Remote Management & Provisioning



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LVS 9000 Series
Product Details

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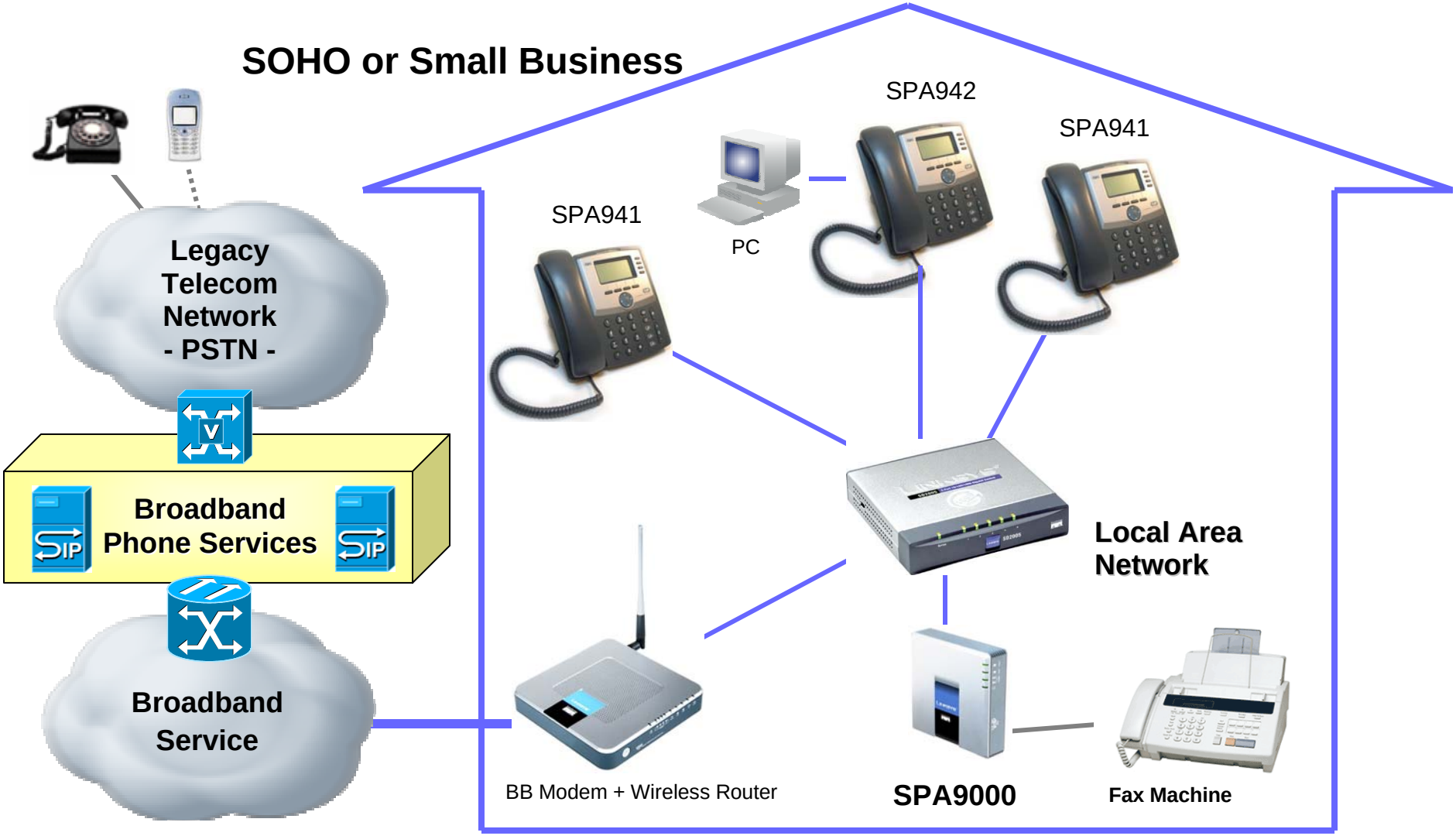
Typical LVS Set-Up – 16 Phones Max



PSTN = Public Switched Telephone Network

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IP Telephony Communication System Features

- Automated Attendant
  - Reduce Cal Load On Receptionist (No Receptionist)
  - Professional Welcome for All Callers
  - Single Number Access to All Employees
  - Guaranteed Call Completion
  - Fast, Easy Set-Up and Maintenance
- Automatic Call Distribution / Routing
- Bridged / Shared Line Call Appearance
- Call Transfer
  - Attended
  - Blind
- Call Forwarding
  - When Busy
  - When Not Answered
  - All Calls
- Find-me
  - Simultaneously Ring Multiple Phones
- Local and Corporate Directory
- Call Pickup
- Group Paging
- Intercom
- Call Hunt Groups
  - Sequential
  - Round Robin
  - Random
- Voice Mail Integration with SP
- Music on Hold
  - Locally Stored
  - Network Based
- Do Not Disturb
- Three Party Conference Calling
- Call Park and Retrieve from Any Station

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Linksys Small Business / IP Centrex

IP PBX / Key System

V2

V1

SPA9000
2 Ethernet Ports
2 FXS Ports
Configuration Server
SIP Proxy Server
Application Server (SIP)
Media Server

***** Via a software license key the SPA941 and SPA942 can be upgraded to 4 extensions. The SPA9000 can be upgraded to support up to 16 users (Phones).

IP Phones with 1 Ethernet Port

SPA941*
Graphical Display
2 or 4 Extensions
4 Line Keys
4 Soft Keys

SPA921
Graphical Display
1 Extension
No Line Keys
4 Soft Keys

SPA901
Wall or Table Mount
Rugged Design
Flash, Redial, Vol. Buttons
No Display

IP Phones with 2 Port Ethernet Switch and Power Over Ethernet

SPA942*
Graphical Display
2 or 4 Extensions
4 Line Keys
4 Soft Keys

SPA922
Graphical Display
1 Extension
No Line keys
4 Soft Keys

Note: The SPA922 and SPA942 support PoE and as such, **do not come with a power supply**. Optionally, the PA100 power supply for Linksys IP Phones may be ordered separately.

VoIP Accessories

WBP54G
802.11G WiFi Dongle for VoIP
Uses VoIP Device's Power Adapter
Works with Any 5V Linksys VoIP Device

POES5
802.3af Compliant
PoE Dongle for VoIP

VoIP-PSTN Gateway

SPA3000
PSTN Gateway

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Core Components of the SPA9000

- **SIP Proxy and Registrar Server**
  - Accepts registration from client stations and proxies SIP messages.
- **Media Proxy Server**
  - Proxies RTP packets between client stations and proxies SIP messages.
- **Configuration Server**
  - Serves configuration files to client stations and auto configures un-provisioned client stations.
- **Application Server**
  - Supports advanced features such as; Call Park/Pickup, Directory, Directed Call Pickup and Group Paging.
- **Music on Hold Server**
  - Streams Audio Files to User's Phones (Both On-Net & Off Net).
  - Optionally: An External Server May be Used for Music on Hold
- **Web Server**
  - Used for Configuration and Monitoring System Settings
- **ATA with 2 FXS Ports**
  - Each FXS port can be connected to analog phone or fax machine.
  - The two FXS ports can only register to the internal proxy server.

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LVS 9000 Key Benefits

When Used with Linksys SPA900 Series Phones, the LVS 9000 Delivers a Best-In-Class User Experience for a Fraction of the Cost of a Traditional PBX System.

- Easy Installation and Maintenance
  - Automatic Discovery and Configuration of Linksys IP Phones
  - Configuration “Wizard” for LVS 9000 Administrator
  - Tight Integration with Broadband VoIP Service
  - Low Touch Provisioning
- Advanced Easy to Use Features
- Scalable, Flexible Architecture
- Low Cost of Ownership and Operation

A Powerful IP Telephony Solution for a SOHO or Small Business !!

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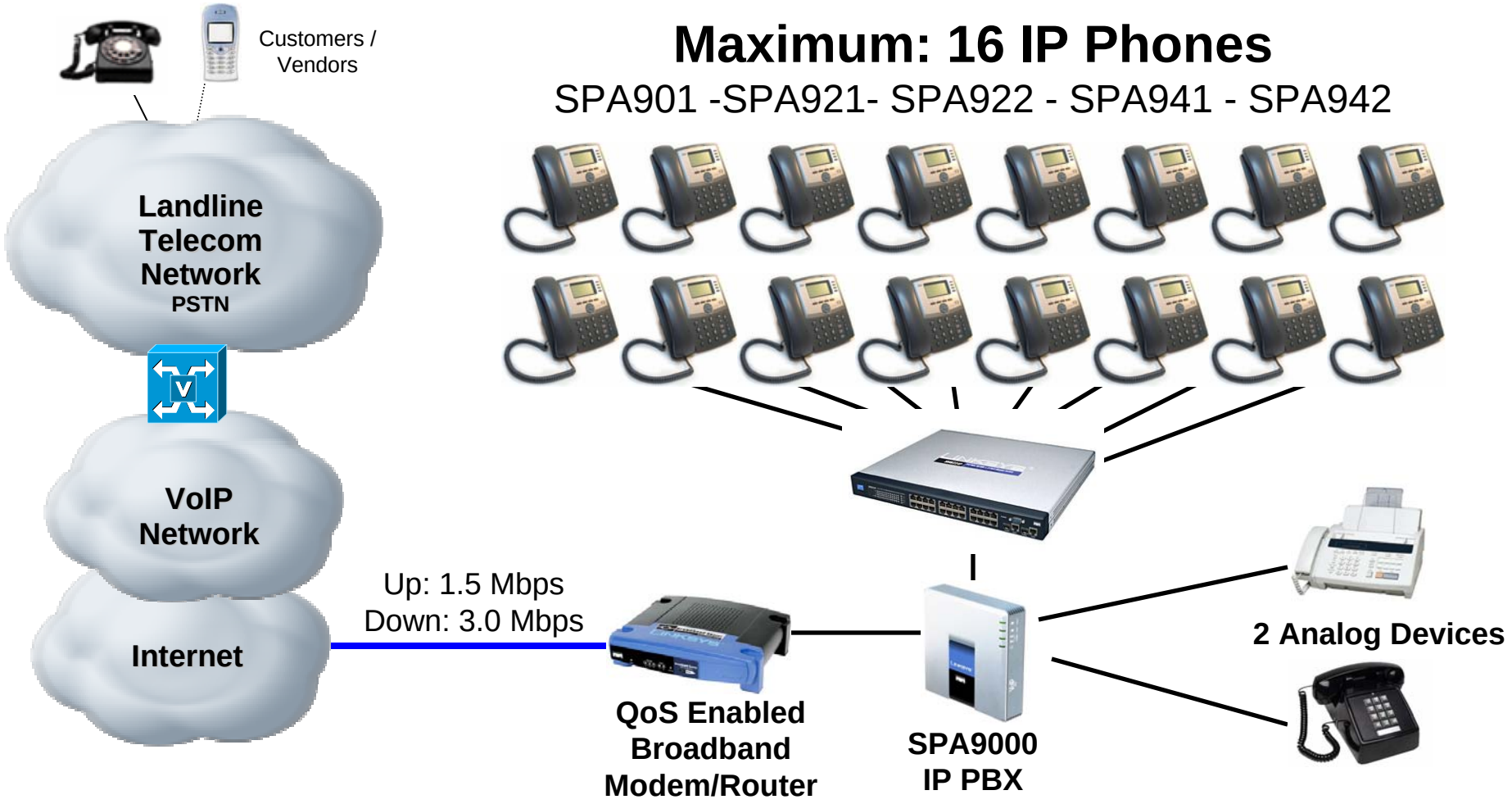
16 IP Phones + 2 Analog Devices



Maximum: 16 IP Phones

SPA901 -SPA921- SPA922 - SPA941 - SPA942

Assumption: 110 kbps per Call (one way) budgeted for Off-Net Calling (Phones using G.711)

"Line" Call Capacity Setting: 15

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SPA900 Series Business Phones and Accessories

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SPA900 Series IP Phone Comparisons

SPA901

SPA921
SPA922

SPA941
SPA942

Integrated PoE on Switched Ethernet Port and Second Ethernet Port for PC

SPA922
SPA942

Linksys IP Telephone Comparison Chart

SPA Model	Voice Lines	Ethernet Ports	High Resolution Graphical Display	Power over Ethernet Support
SPA901	1	1	N	N
SPA921	1	1	Y	N
SPA922	1	2	Y	Y
SPA941	2-4	1	Y	N
SPA942	2-4	2	Y	Y

All SPA900 Series Phones Support QoS

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Linksys Multi-Line IP Phones

Key Features of the SPA921/922, SPA941/942:

- High Quality and Distinctive Look and Feel
- Hi-Resolution Graphical Display – 128 x 64 Monochrome
- Backlit Display and PoE on SPA922 & SPA942
- Menu Driven User Interface
- Four Illuminated Line Keys – SPA941 & SPA942
- Four Soft Keys
- Four Way Navigation Button
- Speakerphone with Hands Free Operation
- Headset Port – 2.5mm
- Hold Button
- Call Logging
  - Missed, Incoming, Outgoing
- Personal Directory – 100 Entries
- Message Waiting Light
- Message Retrieval Button
- Volume Control
  - Handset
  - Speaker
  - Headset
  - Ringer
- Illuminated Speaker, Mute and Headset Activation Key
- Audible and Visual Incoming Call Alert

SPA941
SPA942

SPA921
SPA922

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SPA901 IP Phone

- Key Features
  - Rugged Design
  - Desktop or Wall Mountable
  - LEDs:
    - Message Waiting / Visual Ring
    - Status / Holding Call
  - RJ45 Ethernet Connection
  - Ringer Volume Control – Adjustable
  - Fixed Buttons:
    - Flash (Hold, Conference, Swap)
    - Redial
    - Volume Control

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Linksys VoIP Phone Features

SPA901/921/922/941/942 Software Features:

- SPA9000 IP PBX Integration
- Comprehensive Interoperability
- Complete VoIP Features & Management
- Excellent Voice Quality
- Secure Calling via sRTP
- Remote Provisioning via HTTPS, HTTP, TFTP
- 3rd Party Application Server Call Control Interop
  - Broadsoft Broadworks Interoperability
  - SIP B with Bridged Line Appearance Support
- Downloadable Ring Tones
- Network Based Ring Tone Support
- Call Transfer
- Call Back on Busy
- Call Forwarding
- Call Conferencing
- Do Not Disturb
- Hands Free Operation (On products with a Speakerphone)
- Personal Directory – 100 Entries
- Independently Configurable Dial Plan Per Line
- IP Dialing (URI or IP Address) Support
- Call Logs for Incoming, Outgoing, Missed Calls – 60 Entries

SPA941
SPA942

SPA921
SPA922

SPA901

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PoE Splitter for VoIP – POES5

Power Any 5v VoIP Appliance with Power Over Ethernet

- POES5
  - 802.3af PoE Compliant
  - 5 Volt – 2 Amp
  - Low Cost
  - Products Supported
    - SPA1001, SPA2000, SPA2002, SPA2100, SPA3000
    - SPA2102, SPA3102
    - PAP2, PAP2T
    - SPA901, SPA921, SPA941
    - SPA9000

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WiFi – Ethernet Bridge – WBP54G

Turn Any 5v VoIP Appliance or Phone Into A WiFi Endpoint!

- WBP54G
  - 802.11 G WiFi to Ethernet Bridge
  - Configuration Wizard via PC and CD (Included)
  - Uses 5v Power Adapter That Came with VoIP Device
  - WEP, WPA or WPA2 Encryption
  - Very Affordable
  - Products Supported
    - SPA1001, SPA2000, SPA2002, SPA2100, SPA3000
    - SPA2102, SPA3102
    - PAP2, PAP2T
    - SPA901, SPA921, SPA922, SPA941, SPA942
    - SPA9000

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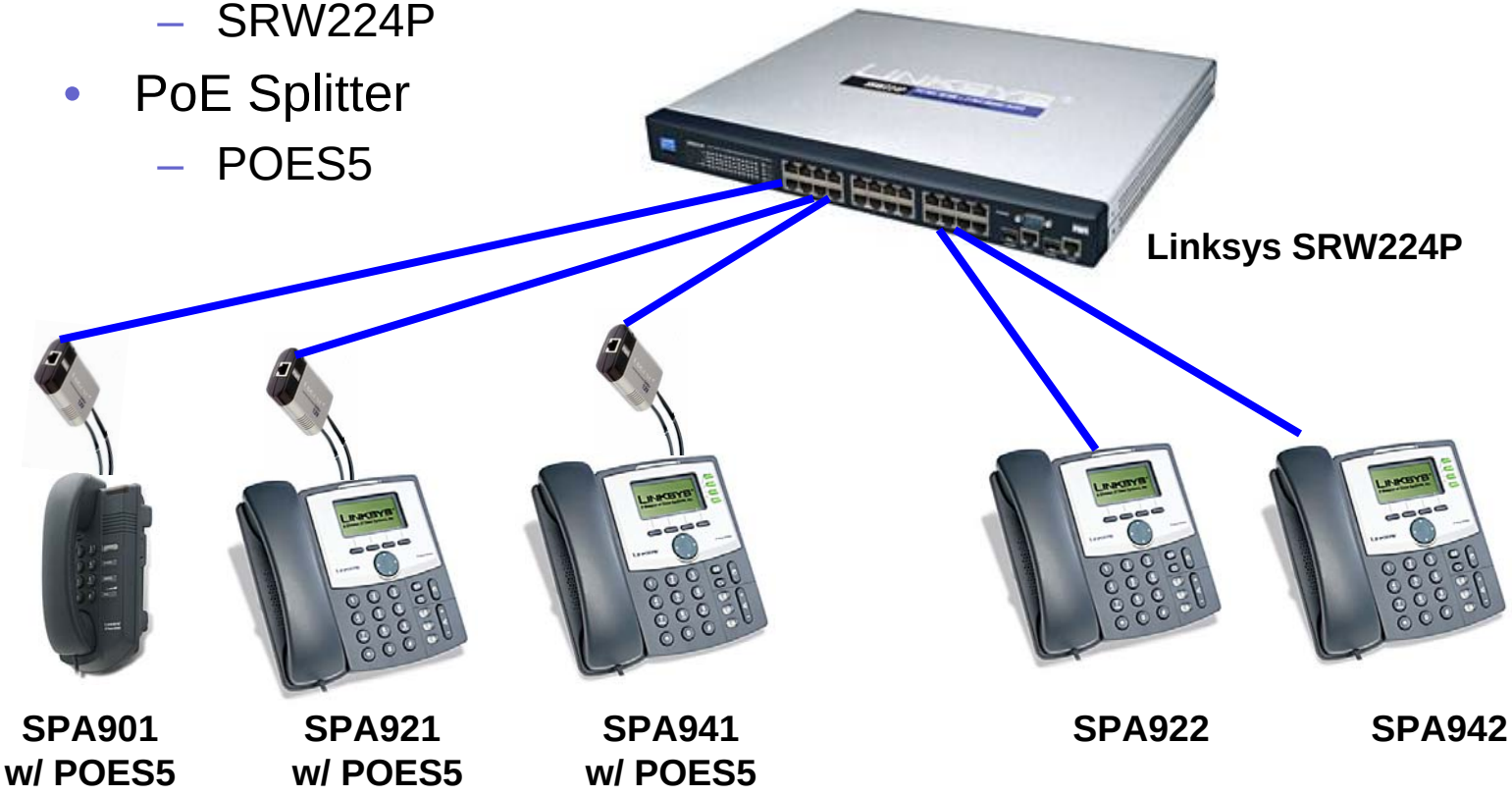
Power over Ethernet Support on SPA9xx Phones

- SPA900 Series Phones with Integrated PoE Support:
  - SPA922
  - SPA942
- PoE Ethernet Switch
  - SRW224P
- PoE Splitter
  - POES5



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SPA3000 – PSTN Gateway + Phone Adapter

- **1 Line Port Provides Call Routing To and From POTS**
  - Transparent Migration from Legacy POTS Service to VoIP
  - Optional Routing of Local, Toll Free Calls to POTS
  - Back Up in Case of Internet Access Problems

- **1 Phone Port Provides Connection for Analog Phone or Fax Machine**

SPA3000
Left and Right Side Views

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LVS 9000 IP Network and VoIP Service Requirements

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Preparing Your Network for LVS 9000

- **Ethernet Bandwidth Budget for Off-Net VoIP Calling**

Codec	Approximate Bandwidth Budget for Each Side of Conversation	2 Calls	4 Calls	6 Calls	8 Calls
G.711	110 kbps	220 kbps	440 Mbps	660 kbps	880 kbps
G.726-40	87 kbps	174 kbps	348 kbps	522 kbps	696 kbps
G.726-32	79 kbps	158 kbps	316 kbps	474 kbps	632 kbps
G.726-24	71 kbps	142 kbps	284 kbps	426 kbps	568 kbps
G.726-16	63 kbps	126 kbps	252 kbps	378 kbps	504 kbps
G.729	55 kbps	110 kbps	220 kbps	330 kbps	440 kbps

Assumptions:
- Bandwidth Calculated with No Silence Suppression
- Two 20 Millisecond Frame Samples
- Propagated over an Ethernet WAN Link.
- Note: The use of Silence Suppression can reduce the average bandwidth budget by over 30%

Reference Web Sites:
VoIP Line Bandwidth Calculator: http://www.erlang.com/calculator/lipb/
VoIP Bandwidth Calculator: http://www.packetizer.com/voip/diagnostics/bandcalc.html

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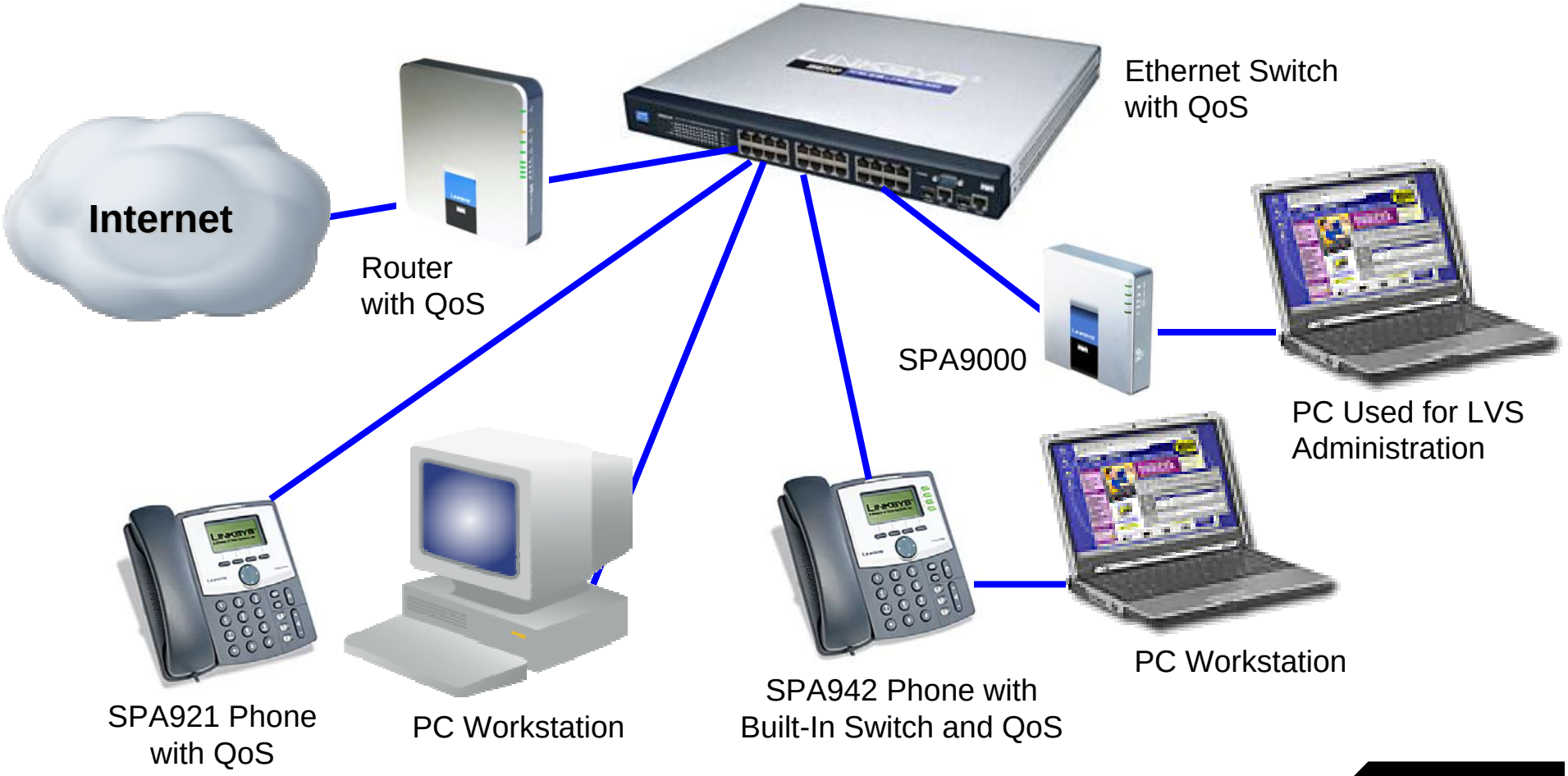
LVS 9000 Installation and Support

- Local Network Considerations
  - If Possible, Use QoS Enabled Routers and Switches



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LVS 9000 Configuration Wizard

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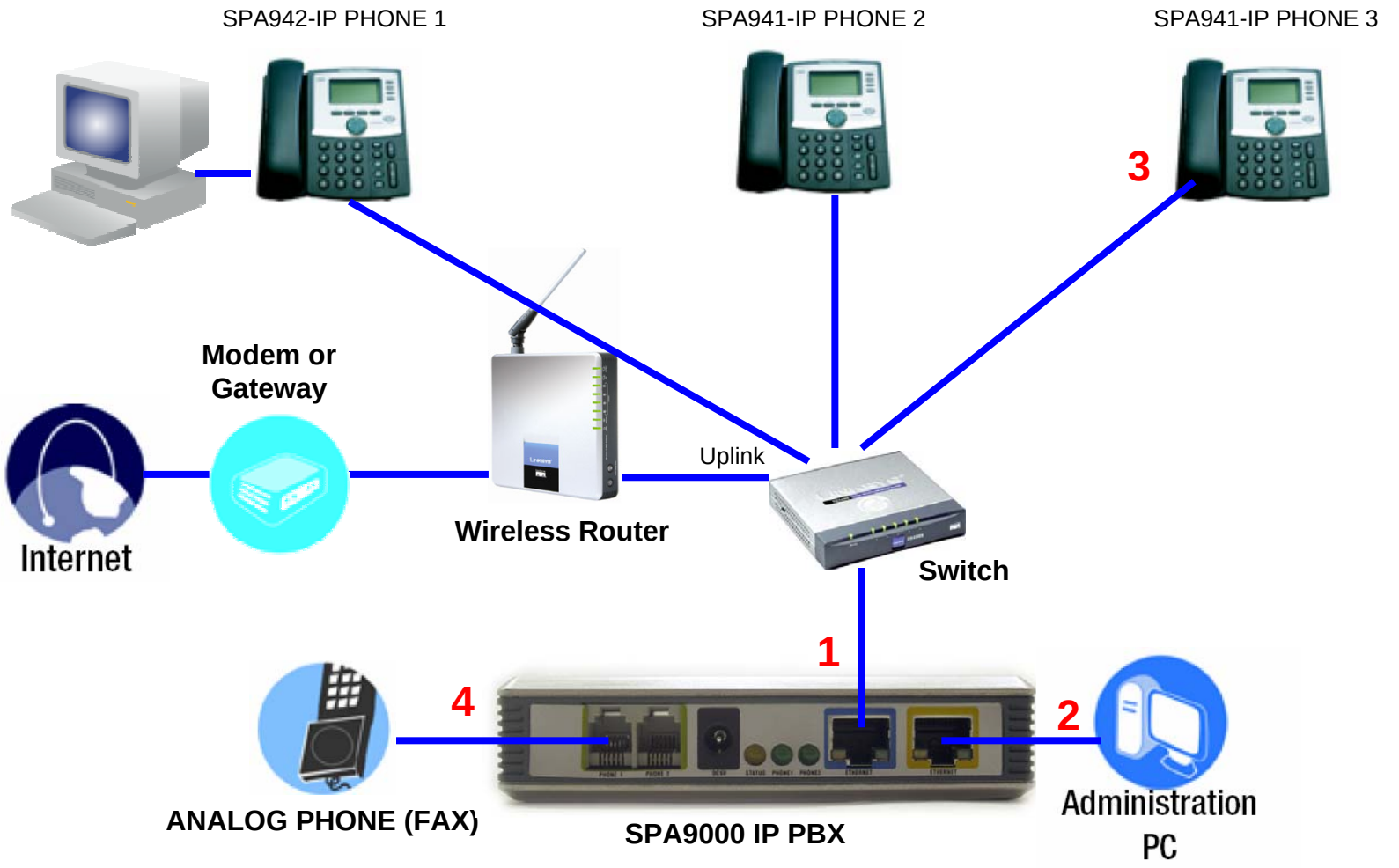
LVS9000 Installation overview



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LVS Configuration Wizard

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LVS Wizard Checklist

- The wizard is available for download from **www.linksys.com** .
  - Unzip the files and run the .exe file from your PC.
  - The PC should be installed in the same network as the LVS 9000 system.
- The following are the minimum required devices needed to be connected to run the wizard:
  - SPA9000 Unit.
  - SPA9xx series phones (SPA942, SPA921, SPA901, etc).
  - A network router and a switch with enough Ethernet ports for all the devices to be in the network.
  - An analog phone --- to be connected to SPA9000 Phone 1 port.
  - A Window based PC to run the wizard.
- A Valid VoIP Service Provider Account and voicemail settings if applicable

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LVS 9000 Wizard Executable

- Wizard can be executed on the LVS system that has been previously configured using the wizard. Changes will be added/modified onto the existing configuration.
- Wizard is meant to simplify the configuration flow with certain assumptions made.
- Do not mix the methods of configuration via the Wizard with a direct modification via the WEB pages of the devices. Direct modification via the WEB pages should ONLY be done by very knowledgeable users.
- We continue to update the functionality of the Wizard to make it more versatile, so please check back regularly on **www.linksys.com** for the latest version.

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LVS Wizard Start Up Pages

- First screen is the standard Linksys “Welcome” page. Following that is the End-User License Agreement (EULA) screen.
- The User Guide is accessible from the “Welcome” and “Introduction” screens.
- We continue to update the functionality of the Wizard to make it more versatile, so please check back regularly on **www.linksys.com** for the latest version.

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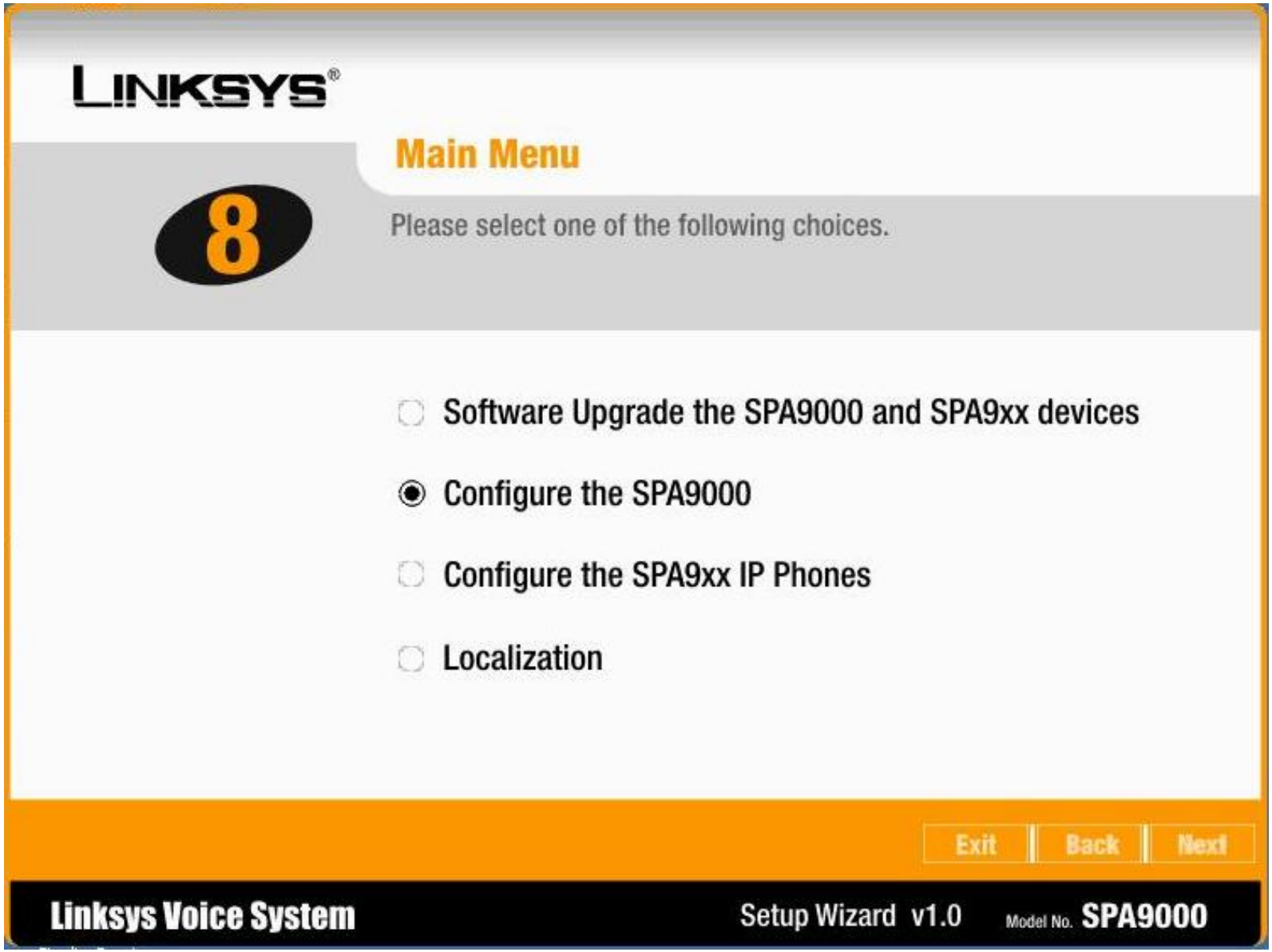
Main Menu Selections



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Upgrade to the Latest Firmware

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Software Upgrade the SPA9000 and SPA9xx Devices

2

You can upgrade the SPA IP Phones in the following steps. Please enter the IP address and admin password of the SPA IP Phones.

Please check the IP address of the SPA IP Phone using the IP Phone's menu button or the IVR.

- Menu button → (scroll down using Navigate button) → Network → Current IP address
- IVR: **** → 110# (use for SPA901 phone)

Device IP: 192.168. 0 . 1

Notice: The Phone's admin password is the same as the SPA9000.

Admin Password: ***

(Leave this field blank if no password is set)

Back Next

Linksys Voice System Setup Wizard v1.0 Model No. SPA9000

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Configure SPA9000 ITSP Information

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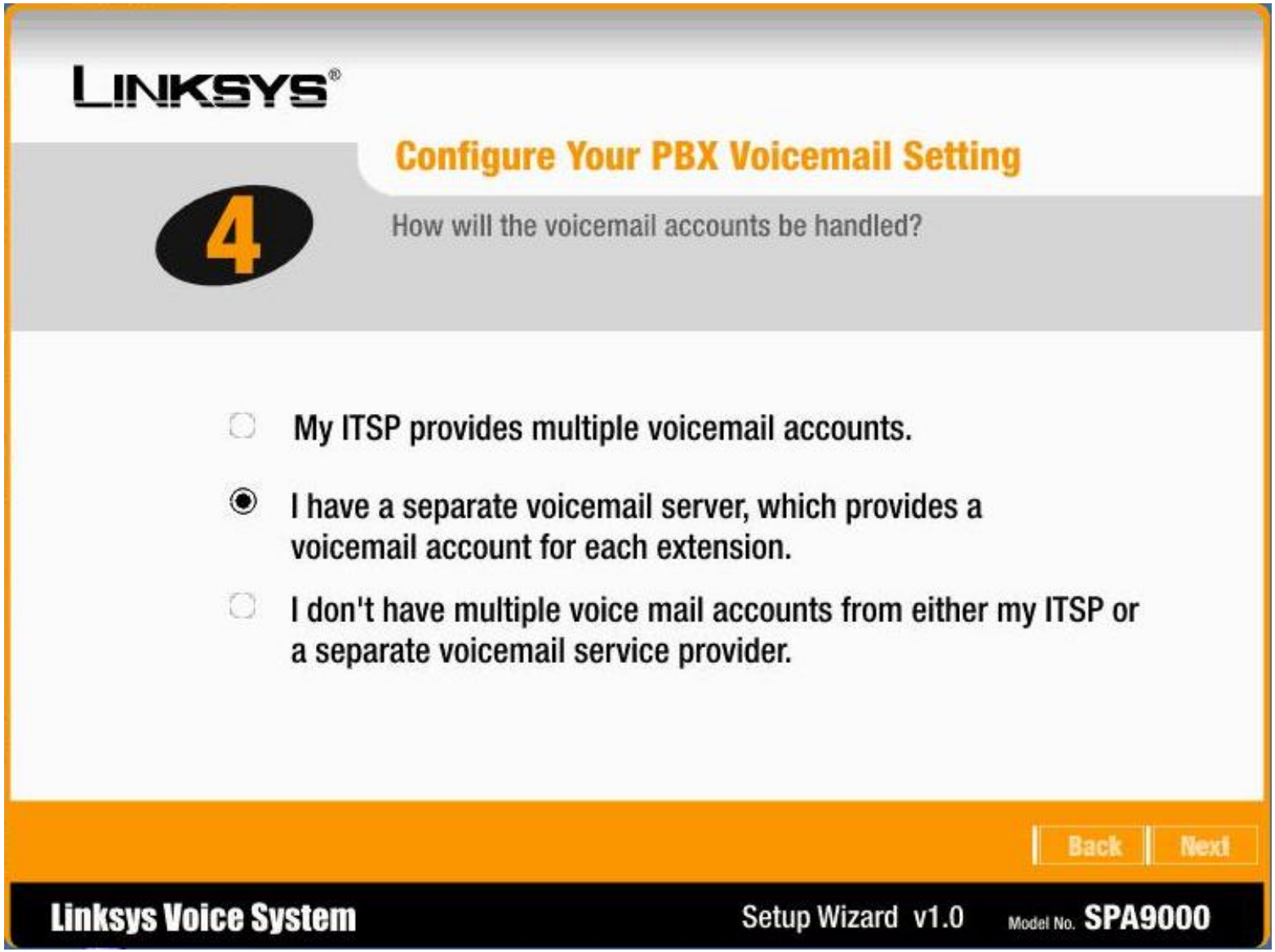
Voice Mail Configuration Options



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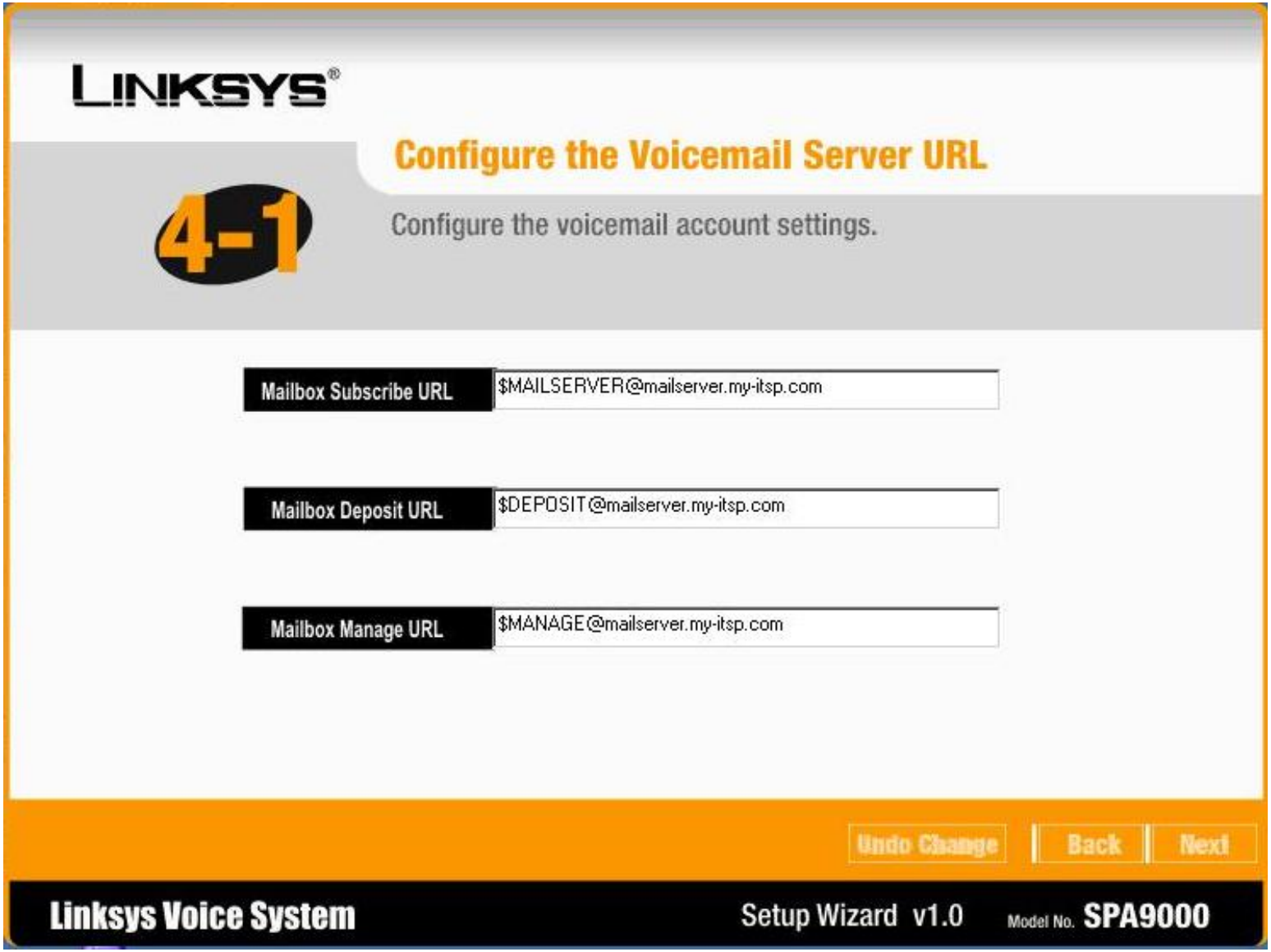
Voice Mail Configuration Settings



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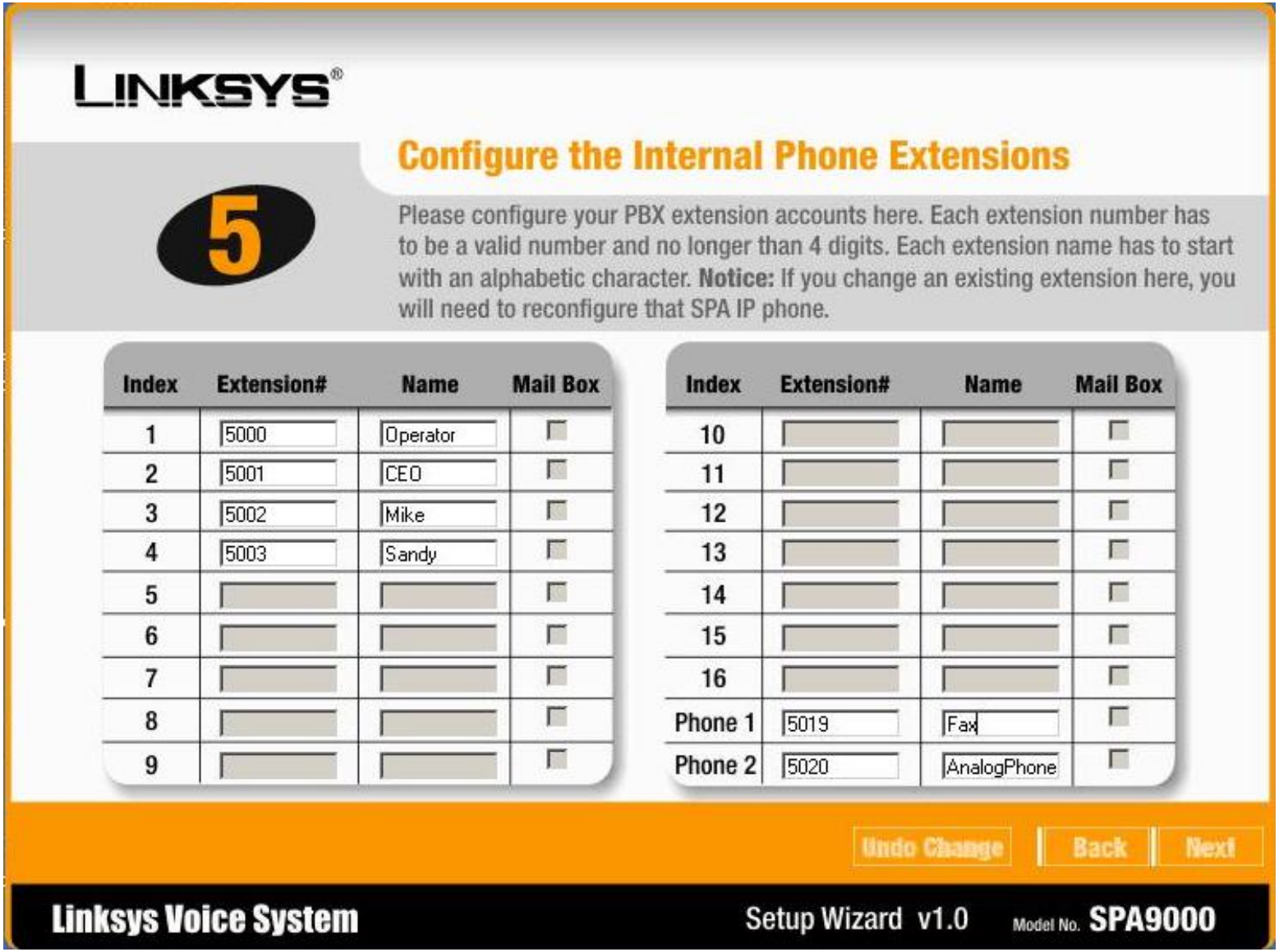
Important: Configuring PBX extensions



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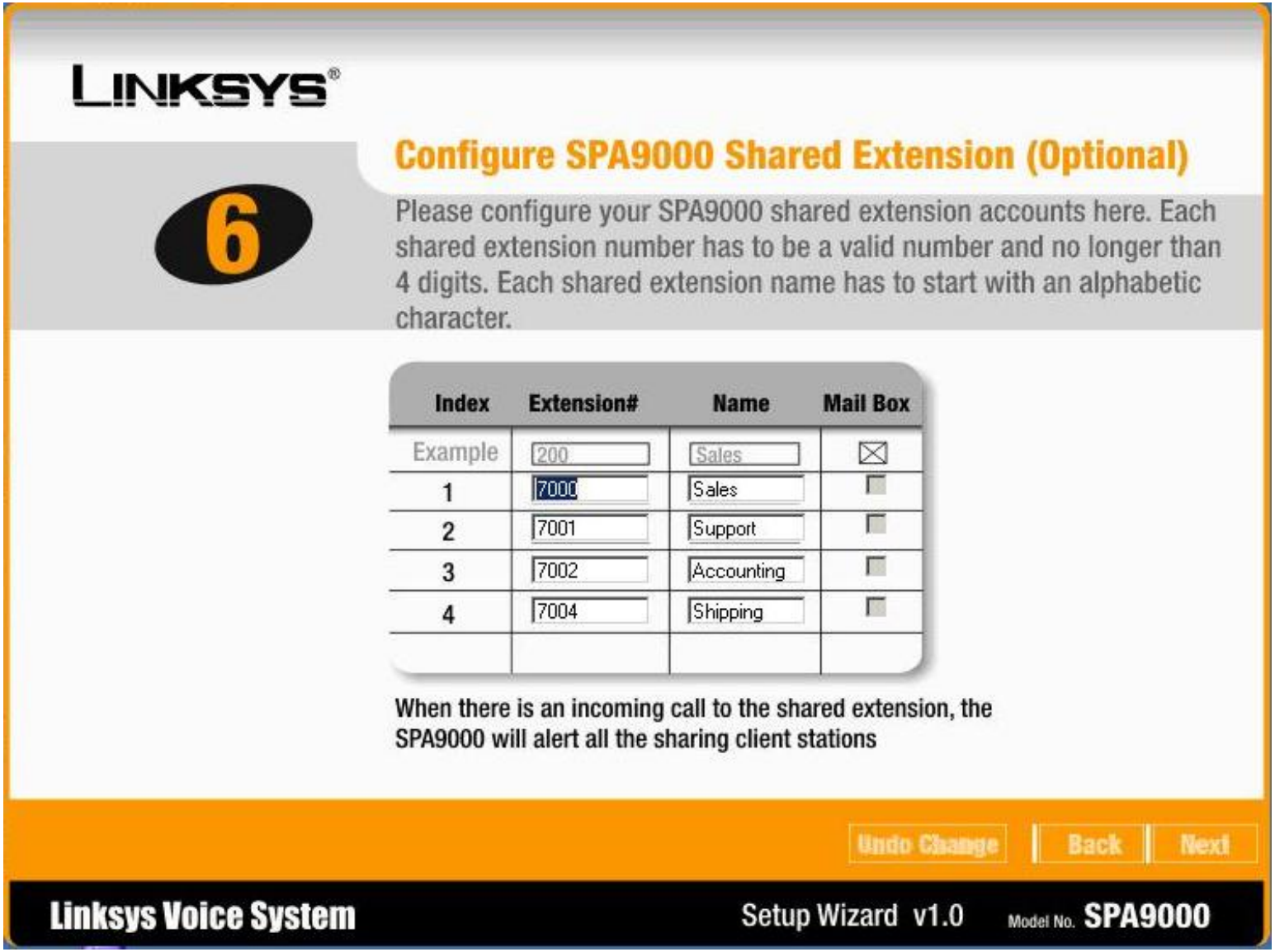
Share Line Configuration



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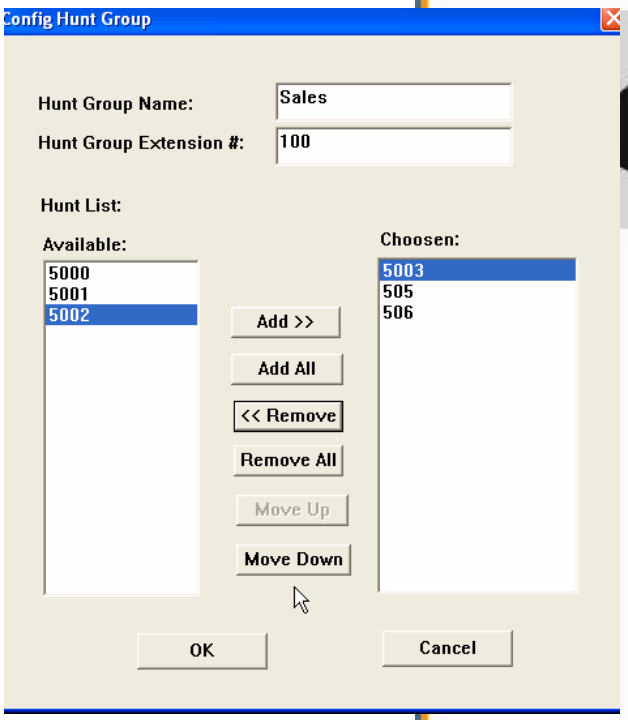
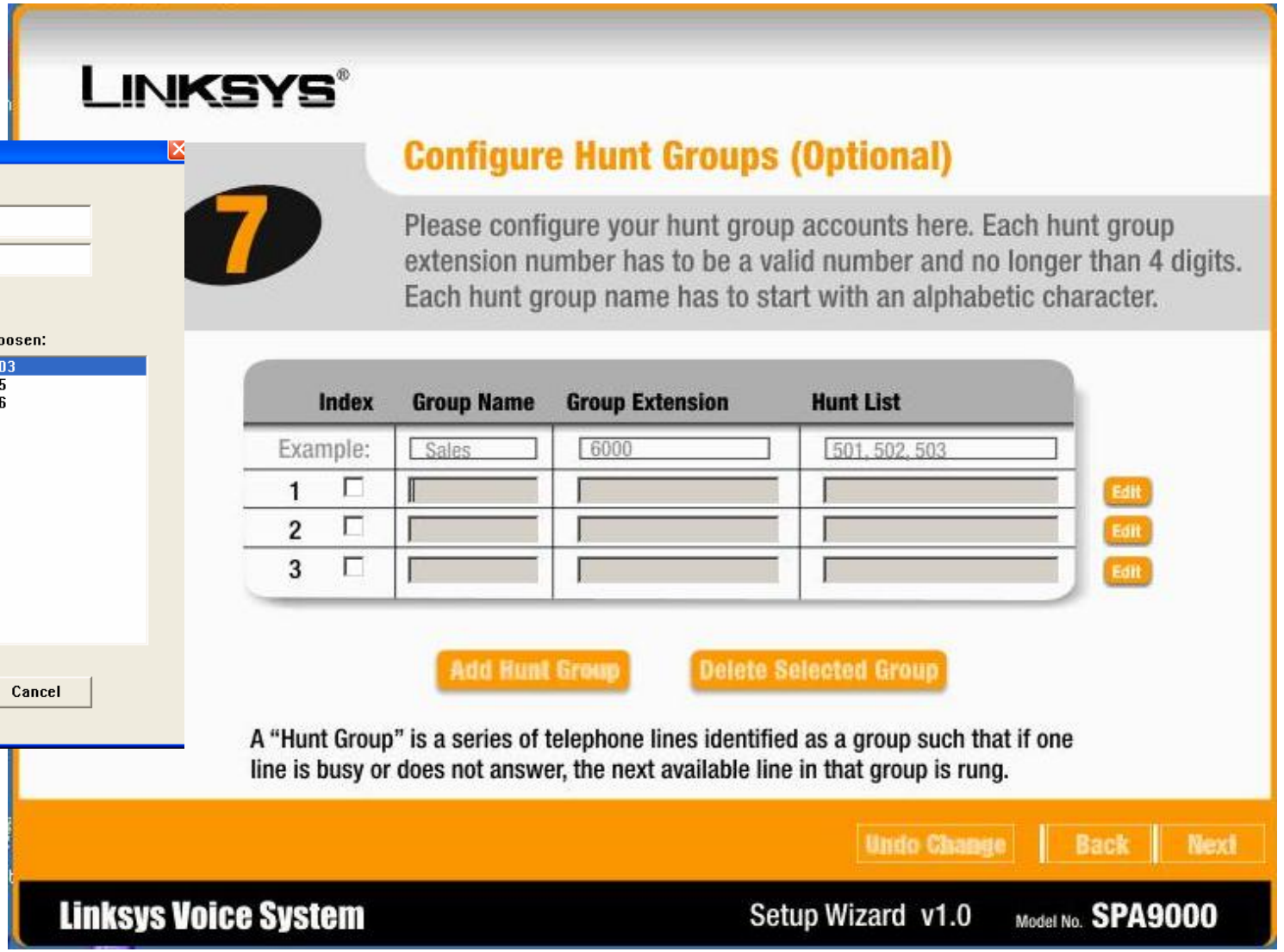
Hunt Group Configuration





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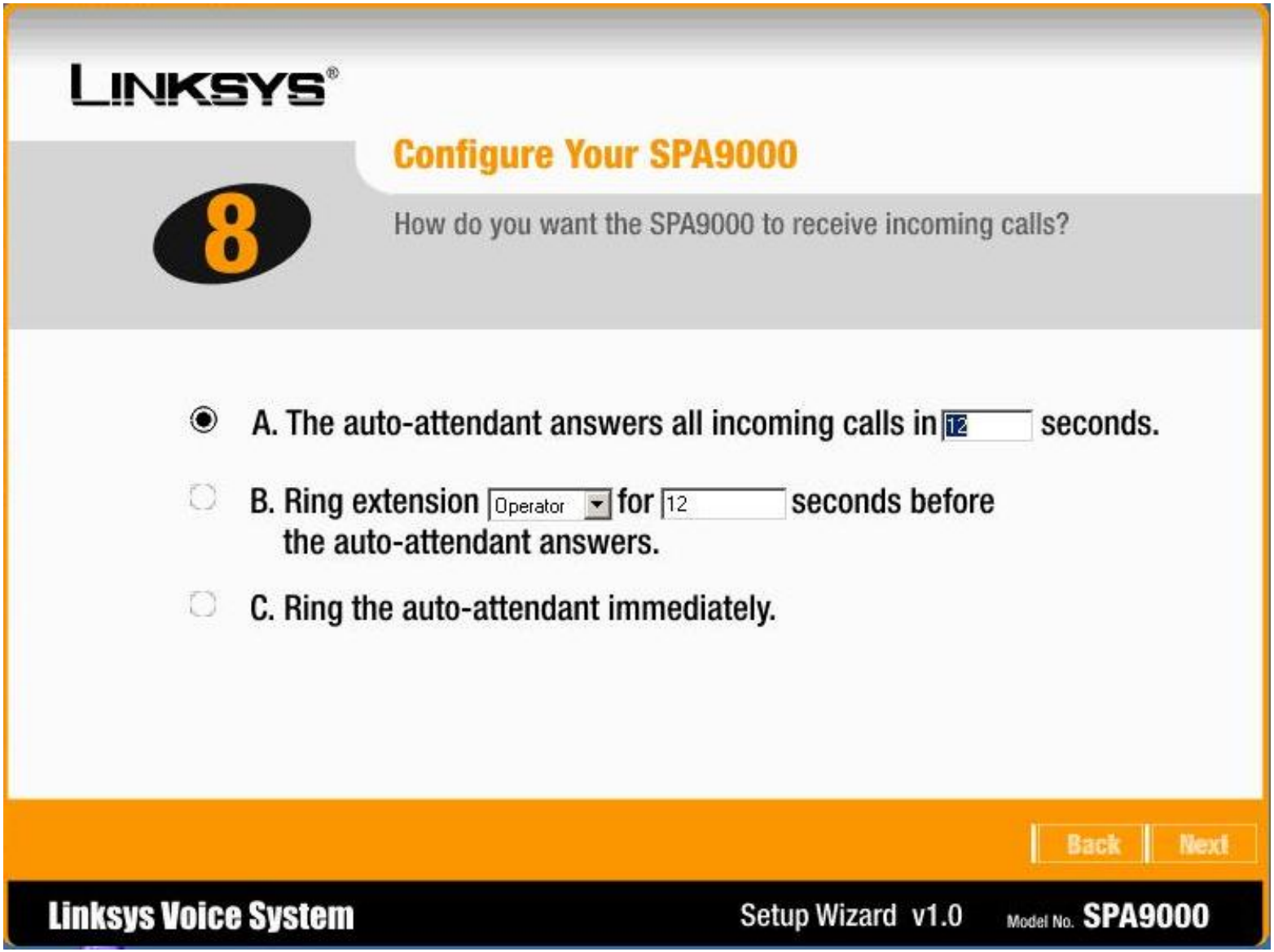
Auto Attendant configuration



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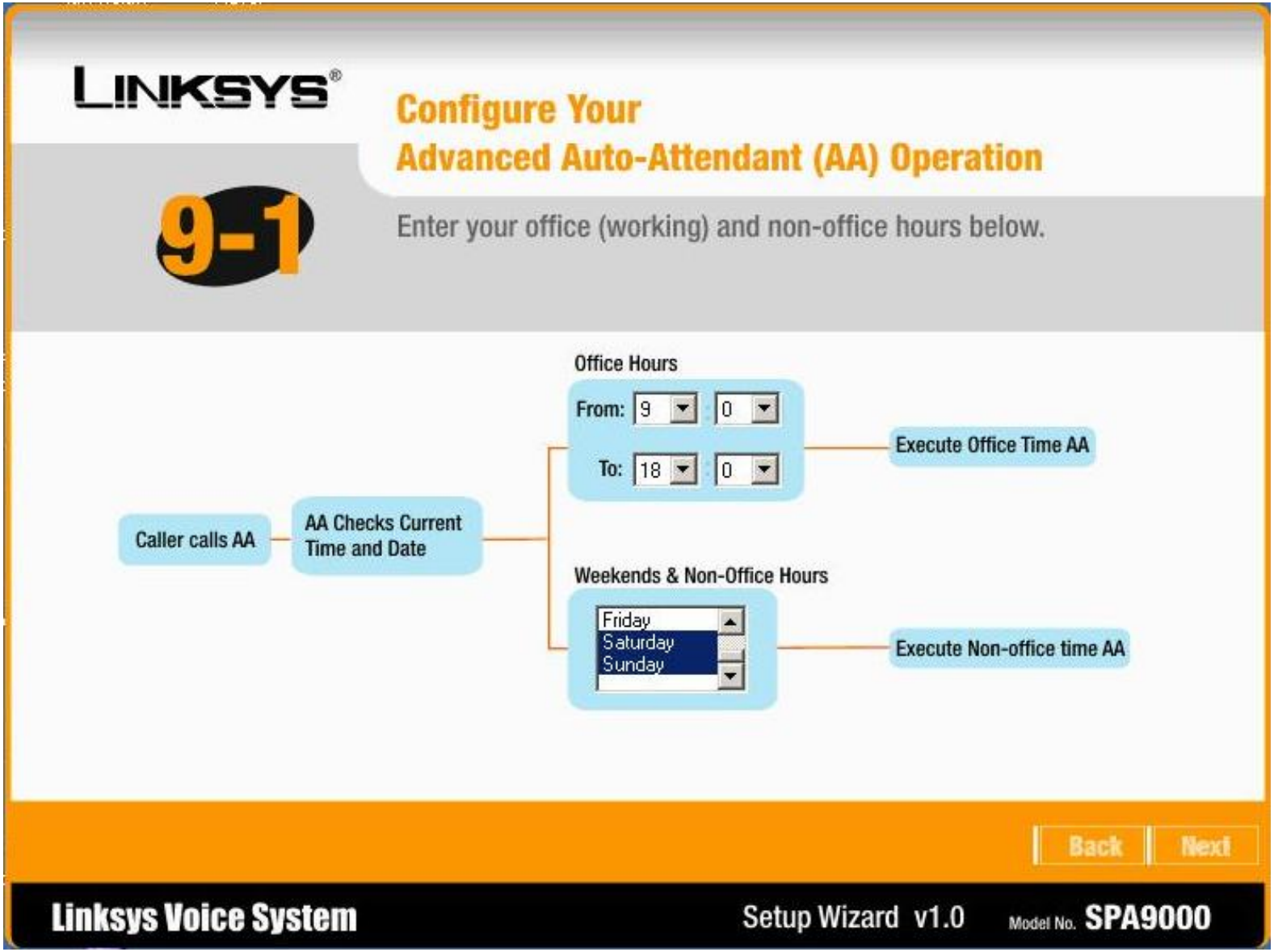
Setting the Working Hours & Off Days



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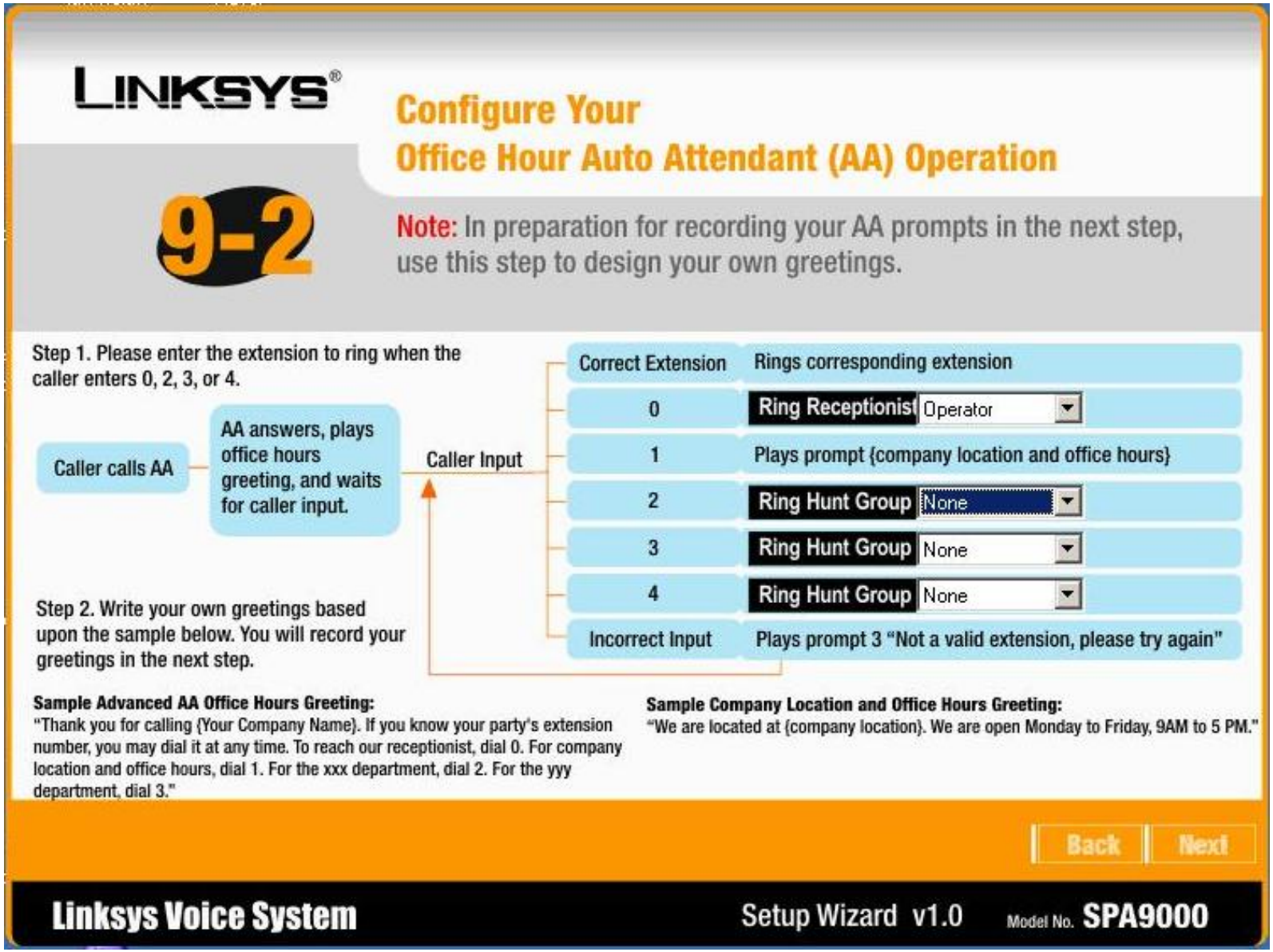
Call Routing by the Auto Attendant (AA)



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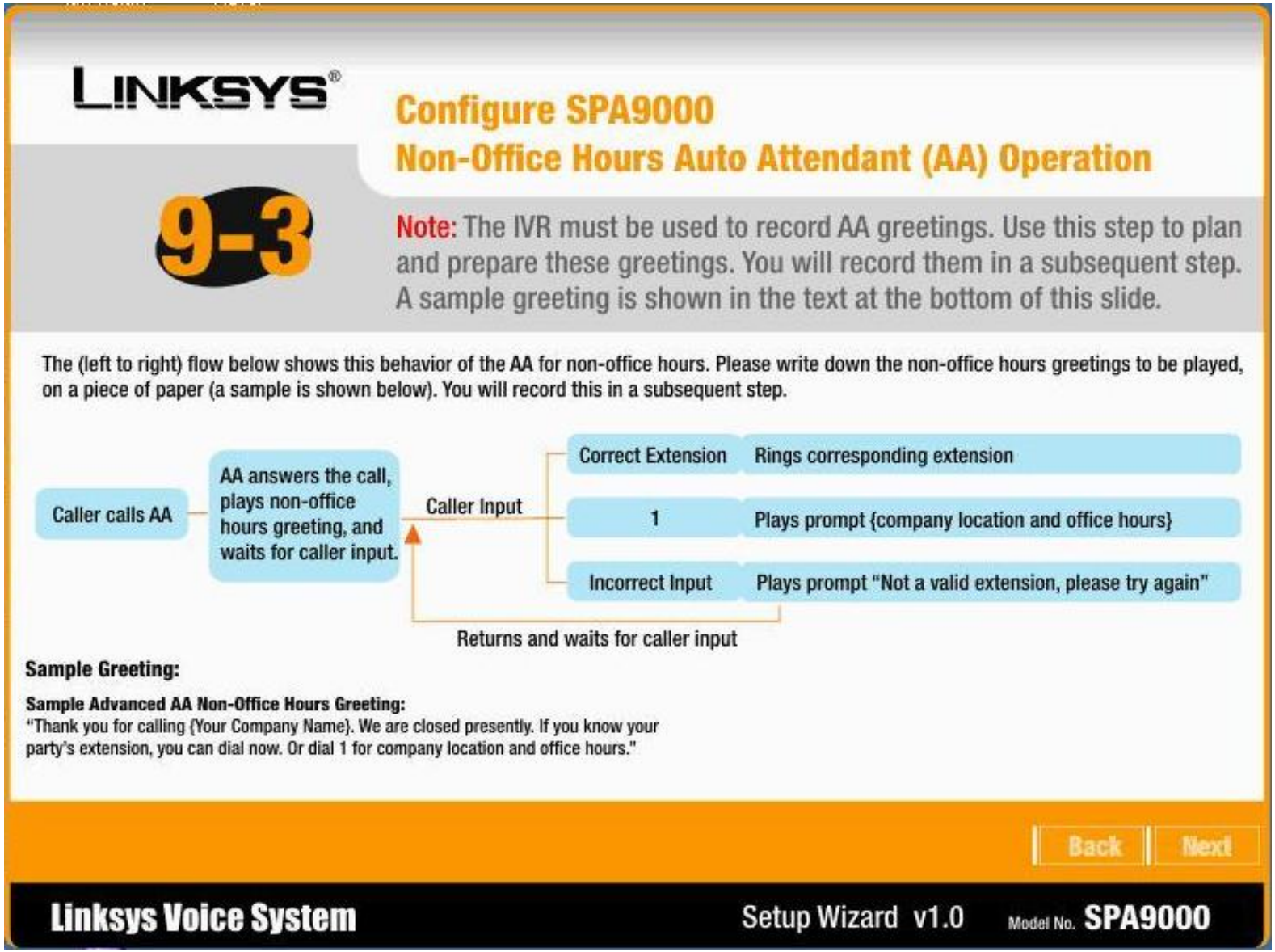
AA Call Flow During Non-Office Hours



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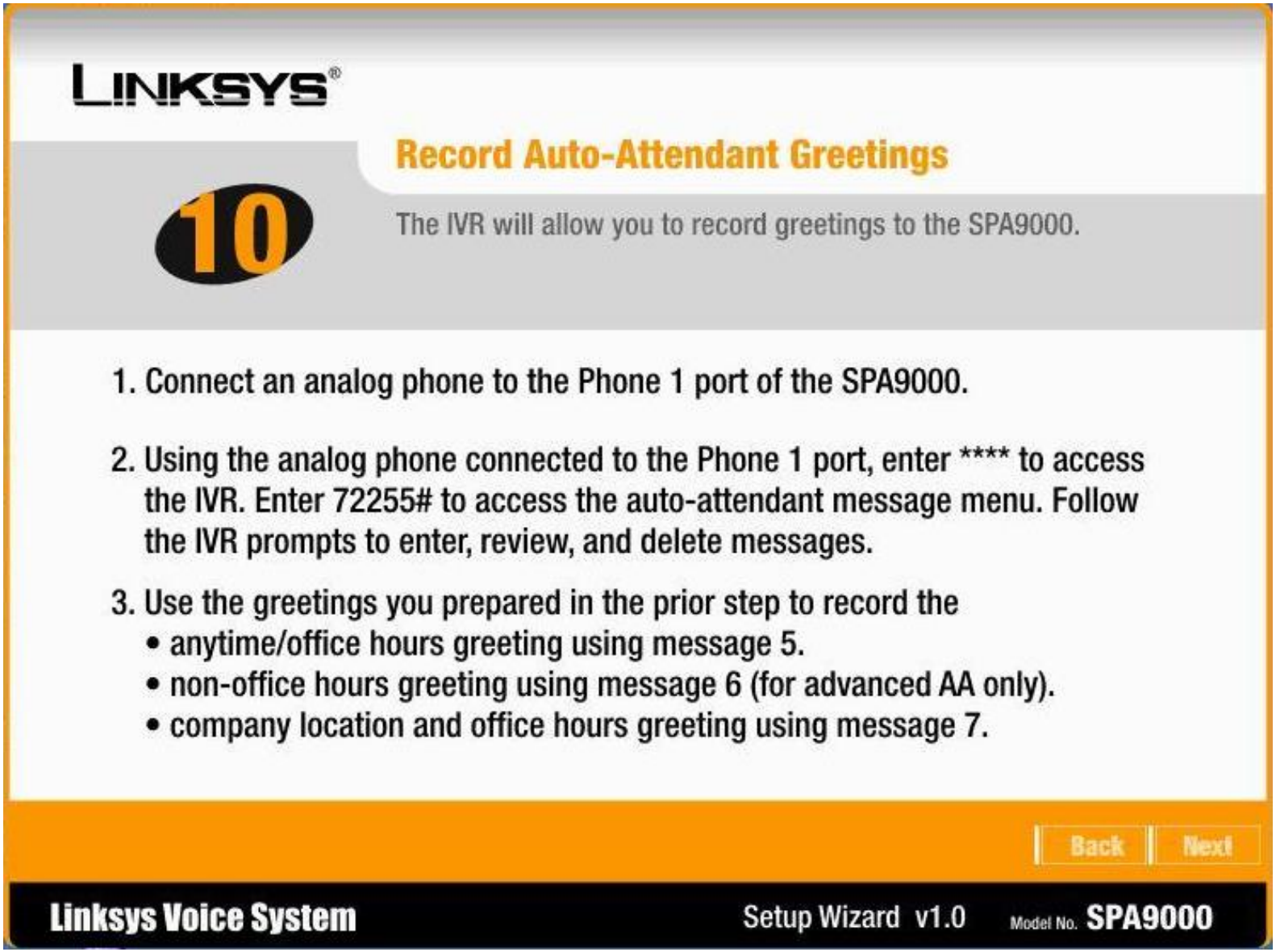
Recording of Messages Into AA



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Configuring Linksys IP Phones

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Configure the SPA IP Phone

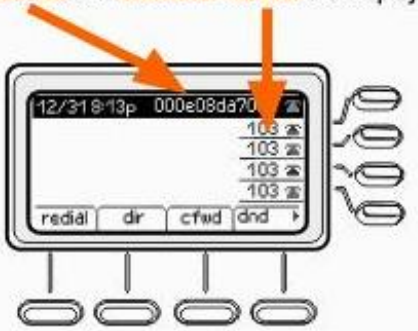
4

If you have previously factory reset the SPA IP Phone, it will take upwards of 1 minute before it will show up in the list below. Hit the refresh list button below to refresh the list of IP Phones to configure.

Select an IP Phone from the list below to configure. Current Phone Operator

Refresh List

SPAxx phone is ready for configuration when the MAC address and extension number are displayed.



SPA901 is ready for configuration when both LEDs are off.

Back Next

Linksys Voice System Setup Wizard v1.0 Model No. SPA9000

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Configuring IP Phone Extensions

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Using the LVS 9000

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LVS 9000 Features

- Placing and Receiving Calls
- Voicemail Support
- Auto Attendant Support

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LVS 9000 Features, cont.

- Call Transfer Support
- Three Party Conference Calls
- Call Forwarding
- Intercom
- Group Paging Support

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LVS 9000 Features, cont.

- Speed Dialing
- Call Logging
- Last Call Return
- Do Not Disturb (DND)
- Corporate Directory
- Directory Dialing Support
- Music on Hold Support

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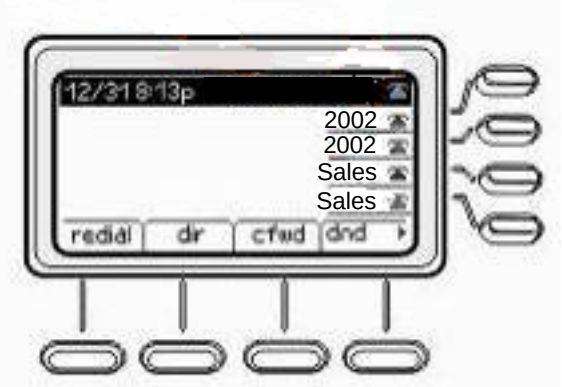
Shared Call Appearance (SLA) Support

- Share Line Appearance (SLA) allows multiple stations to share an extension number and manage a call as a group.



Sales Group Shares the 'Sales" Extension

Line 1: 2002	Line 1: 2005	Line 1: 2013	Line 1: 2004
Line 2: 2002	Line 2: 2005	Line 2: 2013	Line 2: 2004
Line 3: Sales	Line 3: Sales	Line 3: Sales	Line 3: Sales
Line 4: Sales	Line 4: Sales	Line 4: Sales	Line 4: Sales

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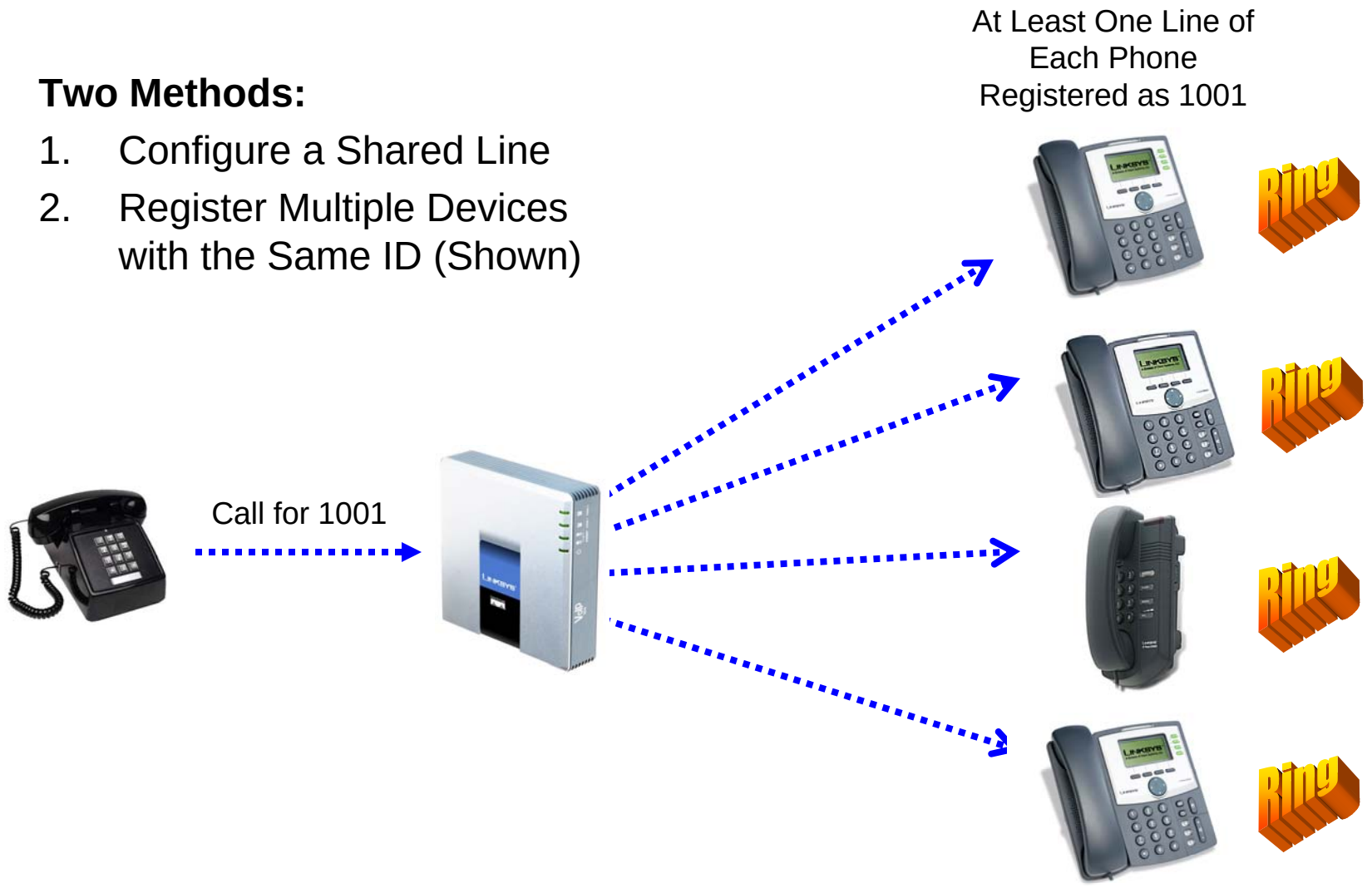
Simultaneous Ringing of Multiple Phones

Two Methods:

1. Configure a Shared Line
2. Register Multiple Devices with the Same ID (Shown)



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Hunt Group Support

Line 1: 2002
Line 2: 2002
Line 3: Sales
Line 4: Sales

Line 1: 2005
Line 2: 2005
Line 3: Sales
Line 4: Sales

Line 1: 2013
Line 2: 2013
Line 3: Sales
Line 4: Sales

Line 1: 2004
Line 2: 2004
Line 3: Sales
Line 4: Sales

SPA9000

Support Voice Mail Box

"Support" Hunt Group:
1. 2002
2. 2005
3. 2013
4. 2004
6. VM: Support

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Directed & Group Call Pick-Up Support

- Directed Call Pick-Up
  - 1. Determine which phone is ringing by listening. This is the target phone.
  - 2. Press the “Pickup” soft key or dial the corresponding *code on your LVS 9000 phone.
  - 3. Wait for your phone to prompt you to enter the target phone number.
  - 4. Enter either the extension number of the target phone.
  - 5. Your phone will then display a menu of calls that are currently ringing on the target phone.
  - 6. Select the call to pickup from the menu.
  - 7. Result: You are connected to the caller of the selected incoming call; the target phone will stop ringing.
  - By default the Directed Pickup * code is: 37

- Group Call Pick-Up
  - To use Group Call Pickup, follow these steps:
  - 1. Determine if any phone is ringing by listening. It could be more than one.
  - 2. Press the “GrPick” soft key or dial the corresponding *code on your LVS 9000 phone
  - 3. Wait for your phone to return a list of all the LVS 9000 phones that are currently ringing. Note that your phone will net be included in this list.
  - 4. Select the target LVS 9000 phone that you want to pickup.
  - 5. Wait for your phone to display a menu of calls that are currently ringing on the target phone.
  - 6. Select the call to pickup from the menu.
  - 7. Result: You are connected with the caller of the selected call; the target phone will stop ringing.
  - By default the Directed Pickup * code is: 36

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Call Park Support

- Call Park and Call Un-Park allow the user to park any call from an LVS 9000 phone and pick it back up from the same or a different LVS 9000 phone.

- To Park a Call, Follow These Steps:
  - 1. While the call is connected, press the “park” soft key on your LVS 9000 phone
  - 2. Enter the parking lot number on which to park the call.
  - 3. Result: Call is parked and you are disconnected from the call.
  - 4. If configured, the parked caller is listening to music.
  - By default the Park * code is: 38

- To Pickup a Parked Call (Sometimes Referred to as “Un-parking” a Call), Please Follow These Steps:
  - 1. Press the “unpark” soft key or dial the corresponding *code on your LVS 9000 phone.
  - 2. Enter the parking lot number where the call is parked.
  - 3. Result: You are connected with the parked call.
  - By default the Unpark * code is: 39

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Adding Phones to an LVS 9000 Network

- The Following Three Options Are Available:
  - 1. The phone can automatically configure itself with the LVS 9000 system. A extension will be automatically assigned to the phone.
  - 2. The LVS 9000 Configuration Utility can be used where by the new phone will be automatically sensed by the LVS Wizard Configuration Utility and can be configured per the utility's interface.
  - 3. A Linksys LVS certified reseller can be consulted to manually administer the new phone in line with the business needs.

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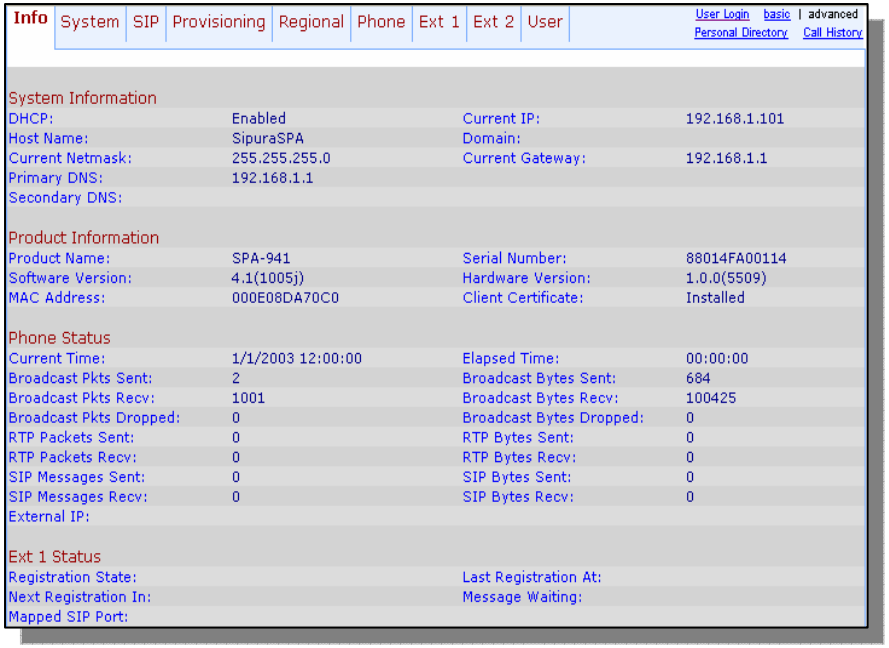
Advanced Configuration via Web Pages

All LVS 9000 series products feature a web server that can be used to independently configure the devices. We highly recommend that VARs wishing to configure the LVS 9000 system in this manner, do so only after they have had extensive experience with the LVS 9000 products and have an expert level understanding of IP networking and VoIP.



Info | System | SIP | Provisioning | Regional | Phone | Ext 1 | Ext 2 | User

User Login basic | advanced
Personal Directory Call History

System Information

DHCP:	Enabled	Current IP:	192.168.1.101
Host Name:	SipuraSPA	Domain:	
Current Netmask:	255.255.255.0	Current Gateway:	192.168.1.1
Primary DNS:	192.168.1.1		
Secondary DNS:			

Product Information

Product Name:	SPA-941	Serial Number:	88014FA00114
Software Version:	4.1(1005j)	Hardware Version:	1.0.0(5509)
MAC Address:	000E08DA70C0	Client Certificate:	Installed

Phone Status

Current Time:	1/1/2003 12:00:00	Elapsed Time:	00:00:00
Broadcast Pkts Sent:	2	Broadcast Bytes Sent:	684
Broadcast Pkts Recv:	1001	Broadcast Bytes Recv:	100425
Broadcast Pkts Dropped:	0	Broadcast Bytes Dropped:	0
RTP Packets Sent:	0	RTP Bytes Sent:	0
RTP Packets Recv:	0	RTP Bytes Recv:	0
SIP Messages Sent:	0	SIP Bytes Sent:	0
SIP Messages Recv:	0	SIP Bytes Recv:	0
External IP:			

Ext 1 Status

Registration State:		Last Registration At:	
Next Registration In:		Message Waiting:	
Mapped SIP Port:			

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Upgrade Ordering Procedure

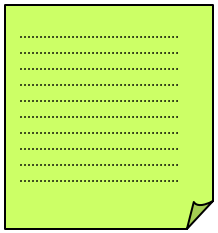
Reseller: Obtain Mac +Serial

Send list to Distributor for Order

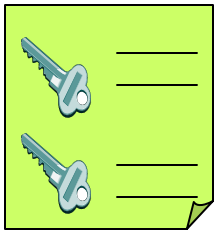
E-Mail to Linksys

Order Processing Generates KEYS

AC: OA:1F:DE:8A:23:AA
ERIAL: 0000121211232



Linksys sends E-Mail with Key per device to Distributor



Disti Receives list with Keys and Forwards to Customer

Customer updates Provisioning Server or Update per Device

Products:
SPA941UPG
SPA942UPG
SPA9000UPG

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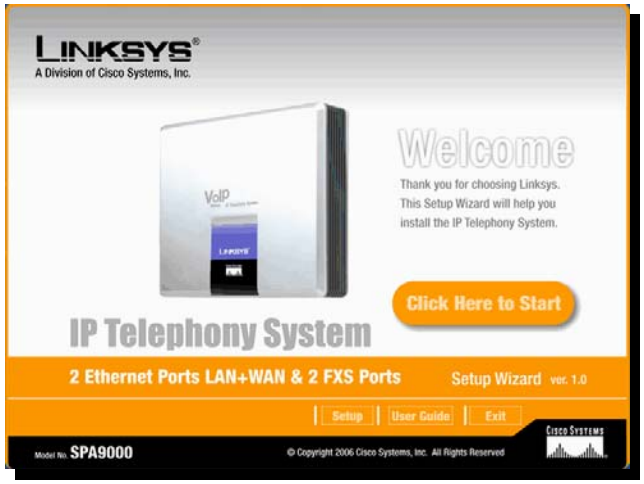
Stay “Connected” to Linksys for Updates and Info

More (Updated) Information Available at Linksys.com

www.Linksys.com



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Questions related to Linksys Products?

ask-linksys-emeapm@cisco.com

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